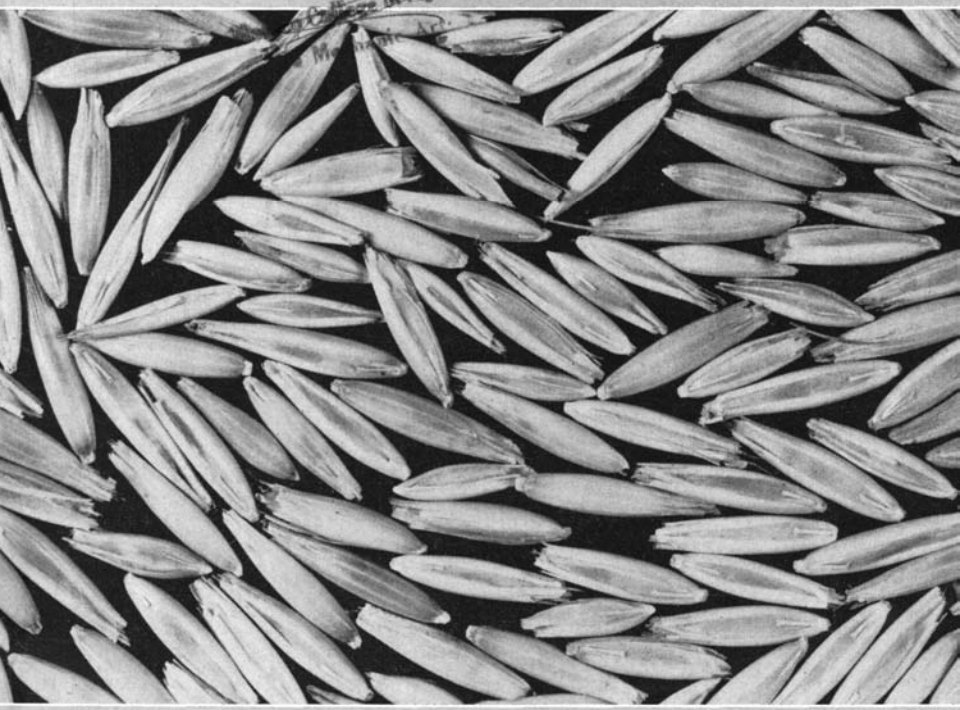
SPRING OATS IN ILLINOIS

By C. M. BROWN, R. M. ENDO, and J. W. PENDLETON



CIRCULAR 788

UNIVERSITY OF ILLINOIS · COLLEGE OF AGRICULTURE
EXTENSION SERVICE IN AGRICULTURE AND HOME ECONOMICS

RECOMMENDED VARIETIES FOR ILLINOIS

(Listed in order of time of maturity)

Northern — Fayette, Nemaha, Minhafer, Newton, Clintland, Clarion, Waubay, Sauk, and Garry.

Central — Fayette, Nemaha, Missouri O-205, Minhafer, Logan, Newton, Clintland, Clarion, and Waubay.

Southern — Fayette, Missouri O-205, Minhafer, Andrew, Logan, and Newton.

CONTENTS

Acknowledgment is due the following individuals for assistance with individual tests: C. H. Farnham, Urbana; R. E. Bell, DeKalb; and P. E. Johnson, Brownstown. Acknowledgment is also due to W. C. Jacobs and R. D. Seif for processing the data; to Ward Reynolds and Sons for providing land and for assistance with tests at Oneida; and to Don Cler and M. D. Jellum for aid with all tests.

Urbana, Illinois

January, 1958

Cooperative Extension Work in Agriculture and Home Economics: University of Illinois, College of Agriculture, and the United States Department of Agriculture cooperating. Louis B. Howard, *Director*. Acts approved by Congress May 8 and June 30, 1914.

SPRING OATS IN ILLINOIS

By C. M. Brown, R. M. Endo, and J. W. Pendleton[1]

ILLINOIS FARMERS planted more than 3 million acres to oats in 1957 and lost an estimated 40 million bushels of their crop to crown rust, also called leaf rust. These losses could have been avoided by using resistant varieties. However, late plantings in some areas indirectly contributed to the loss because crown rust always hits the crop harder in late seasons. Yields in central and southern Illinois were extremely low, but fair to excellent in northen Illinois though some varieties more susceptible to crown rust, such as Clinton and Clarion, suffered considerable damage. In both 1956 and 1957 Race[2] 202 (formerly called Race 45) was the most prevalent race of crown rust. In 1957, Race 216 did considerable damage to most varieties of Victoria parentage, for example, Missouri O-205 and Branch.

Only about 20 percent of the Illinois acreage was planted to varieties resistant to crown rust and only about another 20 percent to varieties tolerant to it. Clinton continued to occupy more acreage than any other variety in Illinois in 1957. However, the acreage in Clinton has declined steadily since 1952 when it occupied 79 percent of the oat acreage. The acreage in Clinton dropped to 76 percent in 1953, 64 percent in 1954, 49 percent in 1955, 39 percent in 1956, and finally 35 percent in 1957. The decline will probably be even greater in 1958 because of the severe damage that Clinton suffered from crown rust in 1957. Newer and more disease-resistant varieties, such as Clintland and Newton, have replaced much of the Clinton acreage. Other varieties that occupied a significant acreage in 1957 were Nemaha, Clarion, Bonda, and Missouri O-205. The relative importance of current varieties will continue to change as new and improved varieties are developed and released.

It is the purpose of this circular to recommend varieties adapted to Illinois conditions, to recommend seed buying and seeding practices, to describe the most common diseases, and to summarize the performance of varieties grown in experimental plots at several locations in Illinois

[1] C. M. Brown, Assistant Professor of Agronomy; R. M. Endo, Plant Pathologist, Field Crops Division, Agricultural Research Service, U. S. Department of Agriculture and Assistant Professor of Plant Pathology; and J. W. Pendleton, Assistant Professor of Agronomy.

[2] Races are strains of the rust fungi that differ in their ability to attack different oat varieties.

during the five years 1953-1957. Yields at each location are shown in Tables 1 and 2. Origin and varietal characteristics other than yield are given on pages 6 and 7. Origin, reaction to disease, and other characteristics are also given in the discussion of each of the tested varieties.

Recommended Varieties

Since climatic conditions vary considerably from place to place and from year to year in Illinois, new varieties must usually be tested for several years before they can be recommended. Temperature more than any other one factor determines the area to which oat varieties in Illinois are adapted. For this reason, the earlier and more heat-tolerant varieties are best adapted to southern Illinois. Other characteristics such as strength of straw, resistance to disease, and ability to yield are also important factors to consider when a variety is to be selected. Such seasonal threats to the crop as disease and lodging can sometimes be lessened by planting two or more varieties that differ in their reaction to disease and in the time they require to mature.

Andrew is from the cross Bond × Rainbow. It matures slightly earlier than Clintland, but has weaker straw and lower test weight. This variety has had a good yield record, especially in southern Illinois in past years. It is resistant to Race 7 of stem rust, susceptible to Race 8 of stem rust, and has tolerance to Race 202 of crown rust but is susceptible to Race 216. Andrew is very susceptible to Septoria black stem. It is somewhat taller than Clintland. Andrew appears to have some heat resistance, which probably accounts for its good record in southern Illinois.

Clarion and Waubay are from the cross Clinton × Marion. In Illinois tests, they have been very similar in performance. Both have stiff straw, good test weight, and both mature slightly later than Clinton. Their yields have been good. Both varieties are resistant to Race 7 of stem rust but susceptible to Race 8 of stem rust, crown rust, and Septoria black stem. They were severely damaged by crown rust in most parts of Illinois in 1957.

Clintland is from the backcross Clinton[4] × Landhafer. Clintland has appeared similar to Clinton in all observed characteristics except that it is resistant to crown rust to which Clinton is susceptible. Clintland is susceptible to Race 7 of stem rust, but is moderately resistant to Septoria black stem. Its straw is equal to that of Clinton. Clintland is recommended as a replacement for Clinton in Illinois, because it is

resistant to crown rust and in all other characteristics is apparently as good.

Fayette is from the cross Vicland × (Branch × (Clinton² × Santa Fe)). Fayette is the earliest and shortest-strawed variety recommended in Illinois at present. It is resistant to crown rust and Race 7 of stem rust but is susceptible to Race 8 of stem rust and Septoria black stem. Its test weight has been good but not quite equal to that of Clintland. The straw of Fayette is not as stiff as that of Newton or Clinton, but in most years this variety will escape severe lodging because of its short straw and early maturity.

Garry is from the cross Victory × (Victoria × Hajira-Banner). Garry is a tall, late variety with a somewhat stiffer straw than that of Branch or Sauk. It is moderately resistant to Race 202 of crown rust but was damaged by Race 216 in 1957. It is moderately resistant to Septoria black stem and is resistant to Races 7 and 8 of stem rust. Garry has the lowest test weight and thickest hull of any variety recommended for Illinois.

Logan is from the cross Benton × Marion. It has yielded about as well as Clinton and Andrew in Illinois. Like Clarion and Waubay, it is rather susceptible to crown rust, Race 8 of stem rust, and Septoria black stem; it is resistant to Race 7 of stem rust. Logan is slightly taller than Clinton and matures several days earlier. It is a yellow oat with a very low percentage of hull. Its test weight is slightly lower than that of Clinton.

Minhafer is from the cross ((Bond-Rainbow) × (Hajira-Joanette)) × Landhafer. Minhafer matures slightly earlier than Clinton. It has good straw but is slightly taller and weaker than Clintland. Its test weight has been slightly lower than Clintland's in most years. Minhafer has the best rust resistance of any variety recommended in Illinois at present, being highly resistant to Races 7 and 8 of stem rust and crown rust. For this reason Minhafer appears to be one of the more promising new varieties for Illinois.

Missouri O-205 is from the cross Columbia × (Victoria-Richland). This is an early, high-yielding variety that appears to be especially well adapted to southern Illinois. Its straw strength is not equal to that of Clintland. This variety produces dark brown kernels of high test weight and low hull percentage. Missouri O-205 has been discounted on the commercial market for the past several years as it is considered unacceptable for milling purposes. For this reason, it has

CHARACTERISTICS OF OAT VARIETIES UNDER ILLINOIS CONDITIONS

Variety	C.I. No.	Parents	Released by	Straw strength	Test weight	Height	Maturity	Disease reaction[a]				
								Stem rust		Crown rust		Septoria black stem
								Race 7	Race 8	Race 202	Race 216	
Advance	3845	D69×Bond	Iowa	Good	Good	V-tall	Medium	S	R	S	S	S
Ajax	4157	Victory×Hajira	Canada	Fair	Fair	Tall	Late	R	S	MR	S	MR
Andrew	4170	Bond×Rainbow	Minn.	Good	Good	M-tall	Medium	R	S	T	S	S
Beedee	6752	Beacon×Hawkeye-Victoria	Wis.	Good	Ex.	Medium	M-late	R	S	MR	T	MR
Bentland	6930	Benton[7]×Landhafer	Indiana	Good	Good	Tall	Medium	S	R	R	R	S
Benton	3910	D69×Bond	Indiana	Good	Good	Tall	Medium	S	R	S	S	S
Bonda	4329	Bond×Anthony	Minn.	Good	Ex.	Tall	Medium	S	R	S	S	S
Bonham	4676	D69×Bond	Mich.	Fair	Ex.	M-short	Early	S	R	T	T	S
Branch	5013	(Forward×Victoria-Richland)×Forward	Wis.	Fair	Fair	Tall	Late	R	S	MR	S	MR
Burnett	6537	(Victoria×Hajira-Banner)×Colo	Iowa	Fair	Ex.	Medium	Medium	R	R	MR	S	S
Cherokee	3846	D69×Bond	Ia., Kan., Nebr.	Fair	Ex.	M-short	Early	S	R	T	T	S
Clarion	5647	Clinton×Marion	Maine	Ex.	Ex.	M-tall	M-late	R	S	S	S	S
Clintafe	5869	Clinton[3]×Santa Fe	Iowa	Ex.	Fair	M-tall	Late	S	R	R	R	R
Clintland	6701	Clinton[4]×Landhafer	Indiana	Ex.	Ex.	Medium	Medium	S	R	R	R	MR
Clinton[b]	....	D69×Bond	Ia., Ill., Ind.	Ex.	Ex.	Medium	Medium	S	R	S	S	MR
Columbia	2820	Sel. from Fulghum	Missouri	Fair	Good	M-tall	M-early	S	S	T	S	S
Craig	5332	Ithacan×Victoria	N.Y.	Good	Good	Medium	Late	MR	S	MR	S	S
Dupree	4672	(Anthony×Bond)×(Richland-Fulghum)	S. Dak.	Fair	Good	Short	Early	S	R	S	S	S
Fayette	6916	(Vicland×(Branch×(Clinton[2]×Santa Fe)))	Wis.	Fair	Good	V-short	V-early	R	S	R	R	S
Garry	6662	Victory×(Victoria×Hajira-Banner)	Canada	Good	Fair	Tall	Late	R	R	MR	S	MR

[a] R = resistant; MR = moderately resistant; S = susceptible; T = tolerant. Tolerant indicates the variety will rust but that the yield and test weight will not be greatly reduced.

[b] Includes Clinton 11, Clinton 11 Lot 25, and Clinton 59.

CHARACTERISTICS OF OAT VARIETIES UNDER ILLINOIS CONDITIONS — Concluded

Variety	C.I. No.	Parents	Released by	Straw strength	Test weight	Height	Maturity	Disease reaction[a]				
								Stem rust		Crown rust		Septoria black stem
								Race 7	Race 8	Race 202	Race 216	
Jackson	5441	Clinton × Marion	Mich.	Good	Good	M-tall	M-late	R	S	S	S	S
James	5015	(Bond × Double Cross) × Nakota	S. Dak.	Fair	Good	Medium	Medium	S	R	S	S	S
LaSalle	5628	Marion × Clinton	Illinois	Good	Fair	Medium	Early	S	R	S	S	S
Logan	6929	Benton × Marion	Illinois	Good	Good	M-tall	Medium	R	S	S	S	S
Minhafer	6913	((Bond-Rainbow) × (Hajira-Joanette)) × Landhafer	Minn.	Good	Good	Medium	M-early	R	R	R	R	MR
Minland	6765	Landhafer × (Mindo × Hajira-Joanette)	Minn.	Good	Fair	M-tall	Early	R	R	R	R	S
Mindo	4328	((Minota-White Russian)-Black Mesdag) × Bond	Minn.	Fair	Fair	Short	Early	S	R	S	S	MR
Mo. O-205	4988	Columbia × (Victoria-Richland)	Missouri	Good	Ex.	M-tall	Early	R	S	MR	S	S
Mohawk	4327	D67 × Bond	N.Y.	Ex.	Ex.	Medium	Medium	S	R	S	S	MR
Nemaha	4301	(Victoria-Richland) × (Morota-Bond)	Ia., Kan., Nebr.	Fair	Ex.	M-short	Early	S	R	T	T	S
Newton	6642	Nemaha × (Clinton × Boone-Cartier)	Indiana	Ex.	Ex.	M-short	M-early	R	S	MR	T	S
Putnam	6927	(Boone × Cartier) × Clinton	Indiana	Good	Ex.	Medium	V-early	S	R	S	S	S
Rodney	6661	(Victoria-R.L.524) × (Victory-Hajira) × Roxton	Canada	Good	Fair	Tall	V-late	R	R	MR	S	S
Sauk	5946	(Forward × Victoria-Richland) × Andrew	Wis.	Good	Fair	M-tall	Late	R	S	MR	S	S
Shelby	4372	Anthony × Bond	Iowa	Good	Ex.	Tall	Late	S	R	S	S	MR
Simcoe	6767	Ajax × Erban	Canada	Good	Fair	Tall	Late	R	S	MR	S	MR
Waubay	5440	Clinton × Marion	S. Dak.	Ex.	Ex.	M-tall	M-late	R	S	S	S	S

[a] R = resistant; MR = moderately resistant; S = susceptible; T = tolerant. Tolerant indicates the variety will rust but that the yield and test weight will not be greatly reduced.

[b] Includes Clinton 11, Clinton 11 Lot 25, and Clinton 59.

recently decreased somewhat in popularity. Missouri O-205 has moderate resistance to Race 202 of crown rust but was damaged by Race 216 in 1957. It is resistant to Race 7 of stem rust but is susceptible to Race 8 of stem rust.

Nemaha is from the cross (Victoria-Richland) × (Morota-Bond). This is an early variety that has short straw and produces large, plump kernels with high test weight. It has been one of the lower yielding of the recommended varieties in most years, but has still continued to increase in popularity. Nemaha is resistant to Race 8 of stem rust and appears to have some tolerance to crown rust, but is susceptible to Race 7 of stem rust. Its straw is inferior to that of Clintland and Newton. The increased popularity of this variety is apparently based on its early maturity and large plump kernels. Also, farmers report that it grinds better than other varieties. It would seem that farmers might well consider replacing this variety with some of the higher yielding varieties that have most of the desirable characteristics of Nemaha. For example, the variety Newton produces grains that are very similar to those of Nemaha, has better straw, and usually yields better. It is not quite as early as Nemaha.

Newton is from the cross Nemaha × (Clinton × Boone-Cartier). This variety has had a good record in Illinois for several years. It has stood better in most years than any other variety. The time required for it to mature has been about the same as that required for Clinton. Newton has a plump, Nemaha-type kernel with a relatively thick hull. It has shown some resistance to crown rust and Race 7 of stem rust, but appears to be quite susceptible to Septoria black stem. In Illinois, the straw has been somewhat shorter than that of Clinton.

Sauk is from the cross (Forward × Victoria-Richland) × Andrew. In Illinois, Sauk has performed somewhat like Branch. The straw is slightly shorter and stiffer than that of Branch. Sauk matures about one day earlier than Branch. Sauk is moderately resistant to Race 202 of crown rust but susceptible to Race 216. It is moderately resistant to Septoria black stem, resistant to Race 7 of stem rust, and susceptible to Race 8.

Varieties Not Recommended

Beedee is from the cross Beacon × Hawkeye-Victoria. Beedee matures several days later than Clintland, is slightly taller, and has weaker straw. It produces very large plump grains with high test

weight. Beedee is resistant to Race 7 of stem rust, is moderately resistant to crown rust, but is susceptible to Race 8 of stem rust.

Bentland was produced by crossing Benton with Landhafer and backcrossing to Benton an additional 6 times. Bentland is very similar to Benton in all characteristics except that Bentland resists crown rust. It grows very tall and often lodges when grown under Illinois conditions. Bentland produces very large kernels with high test weight. Like Benton and Clinton, Bentland is susceptible to Race 7 of stem rust but resistant to Race 8. This variety has been taken off the recommended list in Illinois because of its relatively poor performance in recent years.

Branch is from the cross (Forward × Victoria-Richland) × Forward. It is a tall, late variety that tends to lodge badly when grown in Illinois. Branch is moderately resistant to Race 202 of crown rust but is susceptible to Race 216. It is resistant to Race 7 of stem rust and Septoria black stem, but is susceptible to Race 8 of stem rust. This variety has been removed from the list of recommended varieties in Illinois because of its susceptibility to lodging and relatively poor performance in recent years.

Burnett is from the cross (Victoria × Hajira-Banner) × Colo. In height and time of maturity Burnett and Clintland are about the same, but Burnett has weaker straw than Clintland. Burnett produces plump grains with a high test weight. It is resistant to Races 7 and 8 of stem rust and moderately resistant to Race 202 of crown rust but susceptible to Race 216. Burnett has had a relatively good yield record in the several years it has been tested in Illinois.

Clinton is from the cross D69 × Bond. At one time, it was the most popular variety in Illinois, being grown on almost 80 percent of the oat acreage. The acreage in Clinton has decreased rather rapidly in recent years, though Clinton was still grown on about 35 percent of it in 1957. Clinton should be replaced by Clintland, a variety that has resistance to crown rust and that is the equal of Clinton in all other characteristics. All Clinton selections, including Clinton 59 and Clinton 11 lot 25, are susceptible to crown rust and are no longer recommended for Illinois.

Minland is from the cross Landhafer × (Mindo × Hajira-Joanette). Minland is resistant to crown rust and Races 7 and 8 of stem rust, but is susceptible to Septoria black stem. Minland is an

early-maturing variety; it is taller than Clinton and has a weaker straw. Its grains are thin and its test weight is low.

Putnam is from the cross Boone-Cartier × Clinton. This is a very early variety with medium straw-strength and medium height. It is susceptible to crown rust and Race 7 of stem rust, but is resistant to Race 8 of stem rust. Putnam has not been recommended because of its low yields in most of the Illinois tests.

Rodney is from the cross (Victoria-R. L. 524 × Victoria-Hajira) × Roxton. Rodney is a very late, tall variety with large stems and leaves. The kernels look plump but have thick hulls. Rodney is resistant to Races 7 and 8 of stem rust and is moderately resistant to Race 202 of crown rust but susceptible to Race 216. This variety is thought to be too late for growing in Illinois.

Recommended Buying and Seeding Practices

Buying tips. Beware of high prices, unknown varieties, and unknown seed sources. If you do not know your seeds, know your seedsman.

Consult your farm adviser or the Department of Agronomy, University of Illinois, Urbana, for more information on varieties or for the source of seed.

Demand certified seed.

Seeding tips. Be sure of a high germination rate. Many oats are harvested with a high moisture content and will not grow after storage.

Clean and treat the seed at the recommended rate with Panogen or Ceresan M. Cleaning and treating are profitable practices that help insure good stands of vigorous, healthy plants.

Seed oats after soybeans as a first choice, or after corn as a second choice. On soybean ground, the seedbed needs only to be disked; when a drill is used, even disking may not be needed. Cornstalks should be plowed under to control the organism that produces scab disease and to destroy corn borers. In late wet springs, however, the need to sow at the first opportunity may dictate disking cornstalks rather than plowing them under.

Seed with a drill if possible. A drill puts the seed in the ground at a uniform depth and allows the plants to establish good root systems. In tests at the Illinois Agricultural Experiment Station, drilled oats outyielded broadcast oats by 5 to 10 bushels an acre.

Seed drilled oats at the rate of 8 pecks to the acre; seed broadcast oats at the rate of 10 to 12 pecks to the acre.

A poor stand of legumes is not usually caused by the variety of oats. The more usual cause is a lack of water, especially in May and June. A lack of lime or minerals may also cause poor stands. A thinner rate of seeding the oats or wider drill rows will cut down the competition between the oat and legume crops for moisture, light, and minerals. Row-spacing experiments at Urbana indicate that in seasons when moisture is deficient, early growth and stands of clover may be doubled by widely spaced rows of oats, but a cut in the oat yield of 10 to 20 percent can be expected. For good legume stands, the most promising way to space the oat rows seems to be by plugging every third drill hole.

Oat Silage

An oat crop harvested as silage will produce more pounds of total digestible nutrients per acre than a crop harvested for grain. Early removal of oats at the silage stage will also favor the clover companion crop.

The tonnage of silage from spring oats will vary a great deal. In poor years when the yield of grain averages 40 bushels an acre or less, the yield of silage will run 5 tons an acre or less. But in good years when the yield of grain averages 80 to 100 bushels an acre, the yield of silage will run as high as 10 to 12 tons an acre. In general, silage of the best quality is made from oats cut in the soft dough stage.

Tall-growing, late-maturing varieties will generally produce more tons of silage than earlier-maturing varieties. However, since the oat plant in hot weather can rapidly pass through the best stage for silage, it is desirable to use two or more varieties that differ in maturity. In this way, a grower can put up silage of better quality over a longer period of time. Do not apply nitrogen at extremely high rates because nitrogen applied at high rates will increase the amount of lodging and lower the quality of the silage.

Oat Diseases

The spring oat crop in Illinois was very heavily damaged by crown rust in 1957. Race 202[1] (formerly called Race 45) was the most prevalent race of crown rust in both 1956 and 1957. However, in 1957 Race 216 did considerable damage to most varieties of Victoria parentage. Missouri O-205 and Branch are examples. Stem rust, covered and

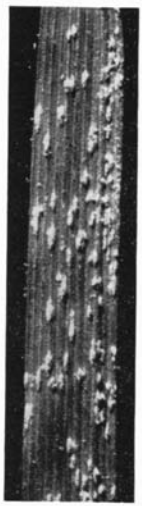
[1] Races are strains of the rust fungi that differ in their ability to attack different oat varieties.

loose smut, Septoria black stem, and yellow dwarf (or red leaf) were also present but did little damage to the crop as a whole.

Crown rust, also called leaf rust, is usually the most damaging oat disease in Illinois. When attacks are severe, rust causes premature ripening, lowering of test weight, and lodging. In 1956 when rust was comparatively light, crown rust decreased yields in northern Illinois by an estimated 7 bushels an acre. This was the average difference in yield between the rust-resistant variety Clintland and the rust-susceptible variety Clinton. These two varieties are identical except in their reaction to crown rust. In 1957 when rust was extremely severe, the difference in yield between the two varieties in north, central, and south-central Illinois was approximately 23 bushels.

Destroying buckthorn will help to eliminate one source of spring infection. But control of crown rust is best obtained by the use of resistant varieties. Control is complicated, however, by the fact that the crown-rust organism is made up of a number of races that differ in their ability to attack different varieties. Fortunately only a few races are usually present in large numbers in any one season in the Midwest. At present, Race 202 is the most common crown-rust race in the Midwest. Crown rust Race 216 was also prevalent in 1957. The reaction of varieties to Race 202 and Race 216 is given on pages 6 and 7. This reaction to rust is considered in making variety recommendations.

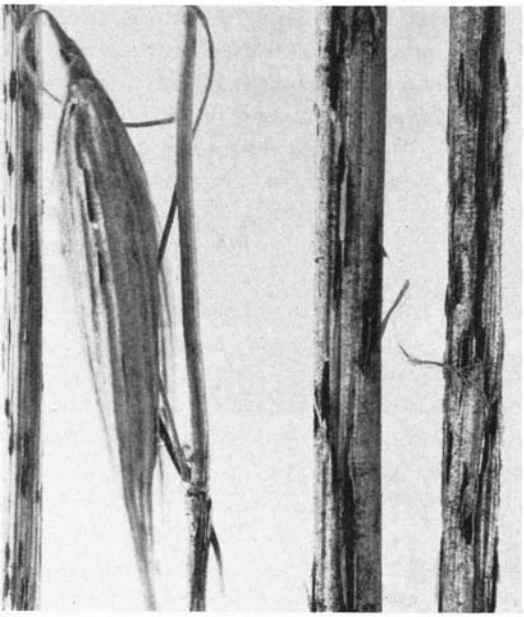
Crown rust is caused by a fungus. It is primarily a leaf disease. The disease gets its name because of the crownlike projections on the black winter spores (teliospores). These spores overwinter on oat and grass stubble and germinate in the spring to produce spores that infect several species of buckthorn. The spores produced on buckthorn in turn infect oats. The main source of spring infection on oats, however, appears to be from spores blown northward by the wind from the southern states. Such spores are formed in the orange fruiting bodies of the fungus that appear most often on the oat leaves (Fig. 1). The spores are carried to other susceptible oat plants by the wind. When moisture and temperature are favorable, the spores germinate and infect the



Yellow-orange fruiting bodies of the oat crown-rust fungus on a leaf. (Courtesy of Dr. W. H. Bragonier, Ames, Iowa.) (Fig. 1)

plants. The fungus produces additional spores. Many cycles of infection may be repeated in the growing season.

Stem rust usually causes some damage to spring oats in Illinois. The amount, however, varies considerably from year to year. Stem rust, like crown rust, is caused by a fungus. Although stem rust is primarily a disease of the stems, all above-ground parts of the oat plant may be infected (Fig. 2).



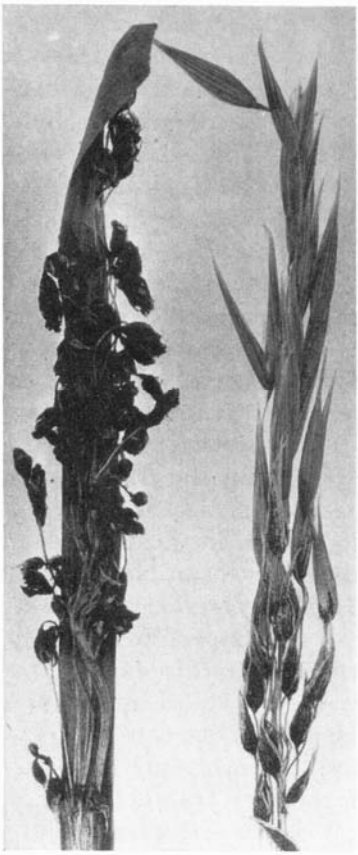
Reddish-brown fruiting bodies of the oat stem-rust fungus on glumes and stem. (Courtesy of Dr. Benjamin Koehler, Urbana, Illinois.) (Fig. 2)

Stem rust, like crown rust, produces two forms of spores on oats, the summer form (urediospore) and the black winter form (teliospore) that overwinters on oats and grass stubble. The summer form can be readily recognized by the oblong, reddish-brown pustules or fruiting bodies of the fungus that appear most often on the stems. The reddish-brown spores are produced in the fruiting bodies. They are carried by the wind to other oat plants and susceptible grasses. When moisture and temperature are favorable, the spores germinate and infect the plants. The fungus produces additional summer spores and many such cycles of infection on oats may be repeated during the growing season. As oats approach maturity, the black overwintering spores or teliospores are produced.

Spring infection of oats comes from two sources: (1) in the spring the black overwintering spores produce spores that infect the common barberry; spores are then produced on barberry that in turn infect oats; and (2) the summer spores of stem rust, like those of crown rust, are also blown in from the southern states.

Control measures for stem rust are similar to those recommended for crown rust; that is, destruction of the common barberry and the use of resistant varieties. The choice of a variety resistant to stem rust is complicated by the fact that several races[1] of stem rust are common at present in the Midwest. These are Races 7 and 8. Just now Race 7 is probably more common than Race 8. A list of spring oat varieties and their reaction to Races 7 and 8 of stem rust is given on pages 6 and 7.

Loose smut and covered smut attack oats in Illinois. Records of the Illinois Natural History Survey indicate that loose smut is the more common in Illinois. Both diseases are caused by a fungus.



Left: Loose smut of oats. *Right:* Covered smut of oats. (Courtesy of Illinois Natural History Survey.) (Fig. 3)

Infection by either smut fungus results in the formation of a dark brown or black spore mass that replaces the kernel. It is sometimes possible to distinguish between the two kinds by means of the membrane that covers the spores. In covered smut this membrane persists (Fig. 3). In loose smut the membrane disintegrates shortly after the oat heads emerge and the spores are left a naked mass (Fig. 3). However, it is not always possible to distinguish between the two smuts, since the symptoms they produce vary with oat varieties.

The spores are carried from the smutted heads to the healthy grain by wind, rain, and harvesting machinery. When oat seeds carrying these spores are planted, the spores may germinate and infect the seedlings. The fungus develops along with the growing point of the susceptible oat variety, forming spores in the individual flowers. When the head emerges, it is smutted.

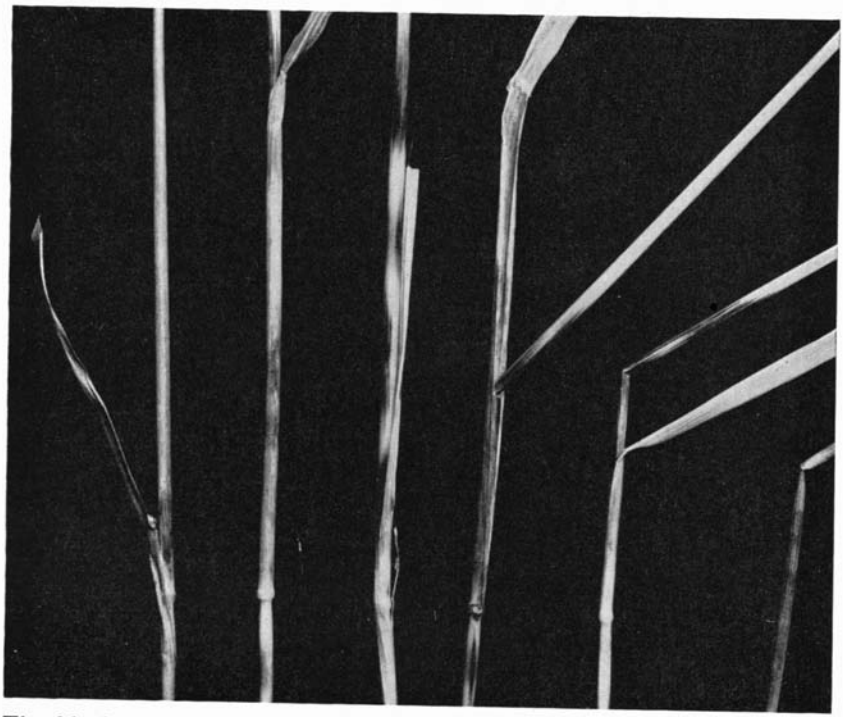
[1] Races are strains of the rust fungus that differ in their ability to attack different oat varieties.

Seed treatment with volatile mercury fungicides if properly applied is effective against both smuts. The treatment destroys the smut spores that are carried on the grain or beneath the hull. Anyone of a number of volatile fungicidal materials may be used — Ceresan M, Panogen, etc. If the material is to be effective, the directions given by the manufacturer must be followed. If seed treatment cannot be made properly, buy certified seed. Most recommended varieties are resistant to smut.

Septoria black stem is caused by a fungus. The disease may be divided into three phases so far as symptoms and effects on plants are concerned.

The leaf-blotch phase appears in the early spring as small purplish-brown spots on the leaves. As the spots enlarge, the infected leaf tissue dies. In severe cases the spots may fuse and cause the entire leaf to die prematurely.

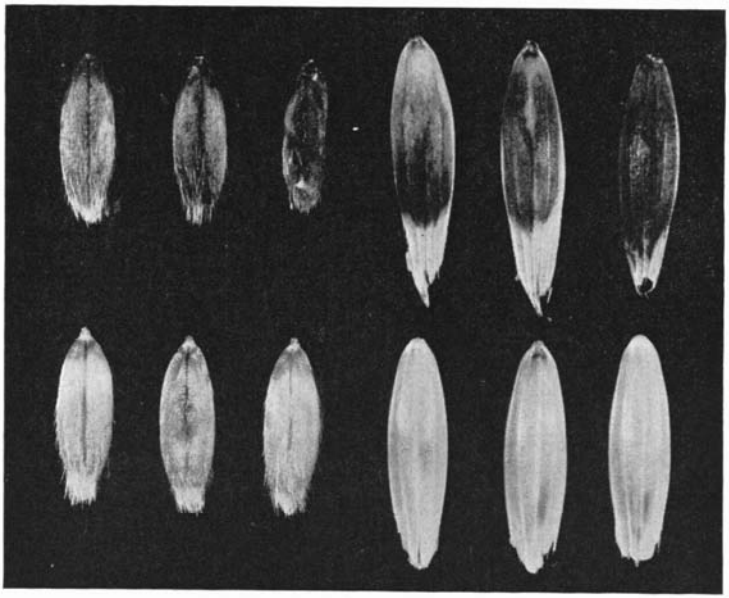
The black-stem phase of the disease is the most destructive. Some time after the plant heads out, the black-stem symptom begins to appear. It is usually observed first on the leaf sheath and around the



The black stem phase of Septoria black stem on stem and leaf sheaths. (Courtesy of Dr. H. C. Murphy, Ames, Iowa.) (Fig. 4)

point where the leaf is attached to the sheath (Fig. 4). From these points it spreads to the stem of the plant where it forms dark brown to black lesions. Plants of varieties susceptible to this disease often will lodge at the points where the lesions occur.

The kernel-blight phase of the disease occurs when conditions are at their best for the growth of the black-stem fungus, the cause of the disease. Then considerable browning of hulls and groats may occur



Kernel blight phase of Septoria black stem. (Courtesy of Dr. H. C. Murphy, Ames, Iowa.) (Fig. 5)

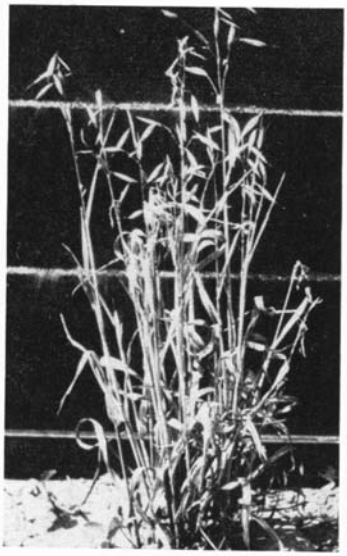
(Fig. 5). This brown discoloration has no noticeable effect on the germination of the seed. The disease is not usually transmitted from infected seed.

Some varieties are more resistant to black-stem disease than others (see pages 6 and 7).

Yellow dwarf, also called red leaf, is caused by a virus. The disease is transmitted by aphids; in many instances, however, the aphids leave before the symptoms appear. The virus is neither seed- nor soil-borne. Typical symptoms of red leaf develop 2 to 3 weeks following inoculation and first appear as yellowish-green blotches near the leaf tip. These blotches soon turn red and fuse, leaving the entire leaf red.

The color may vary from a yellow-red to a red to a reddish-brown, depending somewhat on the variety infected. The rest of the plant may turn dark green to bluish-green.

Plants infected early in the seedling stage become stunted and in extreme cases fail to head (Fig. 6). Severe blasting of the floral parts is associated with the infection. This blasting may involve a few florets or the entire head. The basal florets are usually the most severely affected. The intensity of the symptoms is directly correlated with the age of the plant at the time of infection. Late infection can be recognized by the characteristic reddening of the leaf. All common varieties are susceptible.



Yellow dwarf affected oat plants. (Fig. 6)

Blast, a type of sterility in oats, was common in the 1957 crop. It is usually seen at heading time in the form of white, empty glumes (Fig. 7). Blast may result from any adverse factor or agent that interferes with the physiological processes of the plant, particularly during head development. Some of these factors are unfavorable relationships of moisture, temperature, nutrients, insect infestations, and disease — for example, yellow dwarf.

Left: **A normal head of oats.** ***Right:*** **One oat head showing blasted spikelets. (Courtesy Illinois Natural History Survey.) (Fig. 7)**

The tillers are usually affected more severely than the main stems and the base of the head more than the upper part of it. Some varieties appear to blast more than others, but no variety is immune. Control measures are not available.

Yield Tables

When examining the yield tables, readers are urged to bear in mind that small differences in the performance of varieties do not necessarily indicate actual superiority and that results of tests conducted over a period of years are a more reliable guide to the performance of a variety than the results of tests conducted for only one or two years.

Relative performance cannot be determined with absolute accuracy by any method of testing. Variations in growing conditions, such as soil fertility, are reduced, but not completely eliminated, by replicating or repeating 3 or 4 times at each location. Unavoidable variations in a test may be measured by a mathematical procedure known as "analysis of variance." Using this procedure, figures may be obtained that represent the range that differences between two varieties must exceed before those varieties can be considered significantly different. The method is called the "multiple range test."

This method takes into account the number of varieties that fall within the range as well as the variability of the test. The yield of each variety in each test was compared with the yield of the check variety in that test. Clintland was the check in all tests except those grown at Brownstown where Missouri O-205 was used. The check variety is shown in heavy black type for each location. Annual yields with a double star were significantly higher than the yields of the check variety; annual yields with one star were not significantly different from those of the check; and annual yields with no star were significantly lower than those of the check. Differences necessary for significance were determined only for annual yields.

Table 1. — YIELD OF DRILL PLOTS:[a] Three Locations, 1953-1957

Variety	Bushels per acre								
NORTHERN ILLINOIS: Shabbona, DeKalb County									
	1953	1954	1955	1956	1957	'53-'57	'54-'57	'55-'57	'56-'57
Andrew	71.9	51.8	81.9*	54.3	77.0	67.4	66.3	71.1	65.7
Beedee	....	....	81.3*	78.5**	93.5	....	....	84.4	86.0
Bentland	....	....	88.1*	....	....	....	....	....	....
Bonda	71.9	59.9*	73.4	61.2*	....	....	....	....	....
Branch	87.7**	78.3**	82.5*	64.6*	67.0	76.0	73.1	71.4	65.8
Burnett	....	....	....	71.3*	89.5	....	....	....	80.4
Clarion	85.4*	71.1**	78.8	66.9*	68.5	74.1	71.3	71.4	67.7
Clintland	**79.8**	**63.5**	**90.4**	**68.6**	**104.0**	**81.3**	**81.6**	**87.7**	**86.3**
Clinton 11	76.3*	66.5*	89.2*	52.4	63.5	69.6	67.9	68.4	58.0
Columbia	64.4	57.0	....	....	....	....	....	....	....
Fayette	....	....	....	47.3	95.5*	....	....	....	71.4
Garry	....	....	90.0*	86.8**	76.5	....	....	84.4	81.7
Logan	....	61.3*	79.9*	63.4*	72.0	....	69.2	71.8	67.7
Minhafer	....	....	....	....	115.0**	....	....	....	....
Minland	....	....	71.1	....	....	....	....	....	....
Mo. O-205	79.8*	60.7*	74.9	76.5**	84.0	75.2	74.0	78.5	80.3
Nemaha	72.3	61.6*	81.2*	65.3*	94.5*	75.0	75.7	80.3	79.9
Newton	85.9*	70.2**	86.2*	71.0*	92.0	81.1	79.8	83.1	81.5
Putnam	....	....	....	60.7	90.5	....	....	....	75.6
Rodney	....	86.7**	83.7*	80.1**	67.6	....	79.5	77.1	73.9
Sauk	82.6*	63.9*	81.4*	76.5**	77.0	76.3	74.7	78.3	76.8
Waubay	87.7**	68.6*	79.6*	65.9*	66.5	73.7	70.2	70.7	66.2
Average	76.9	64.2	82.6	67.3	83.0	75.0	73.6	77.0	74.4
EAST-CENTRAL ILLINOIS: Urbana, Champaign County									
	1953	1954	1955	1956	1957	'53-'57	'54-'57	'55-'57	'56-'57
Andrew	62.7*	68.0*	99.9*	70.6*	29.7	66.2	67.1	66.7	50.2
Beedee	....	....	83.9*	77.4**	27.5	....	....	62.9	52.5
Bentland	....	....	59.9	48.8*	....	....	....	....	....
Bonda	58.9*	65.4*	79.9*	56.2*	....	....	....	....	....
Branch	56.8*	61.3*	76.2	70.9*	7.7	54.6	54.0	51.6	39.3
Burnett	....	....	....	79.1**	23.8	....	....	....	51.5
Clarion	63.9**	77.4**	96.1*	73.2*	13.0	64.7	64.9	60.8	43.1
Clintland	**57.5**	**64.3**	**91.2**	**59.5**	**41.1***	**62.7**	**64.0**	**63.9**	**50.3**
Clinton 11	54.2*	67.6*	79.6*	64.7*	7.4	54.7	54.8	50.6	36.1
Columbia	57.7*	70.3*	77.7	52.9*	16.2	55.0	54.3	48.9	34.6
Fayette	....	....	....	60.5*	42.3*	....	....	....	51.4
Garry	....	....	87.9*	80.4**	10.2	....	....	59.5	45.3
Logan	....	65.9*	83.8*	66.7*	20.0	....	59.1	56.8	43.4
Minhafer	....	....	....	....	43.5*	....	....	....	....
Minland	....	....	82.5*	64.4*	....	....	....	....	....
Mo. O-205	61.8*	76.9**	89.3*	61.2*	21.2	62.1	62.2	57.2	41.2
Nemaha	57.5*	67.6*	73.2	57.4*	27.0	56.5	56.3	52.5	42.2
Newton	64.8**	73.5**	86.9*	78.1**	21.1	64.9	64.9	62.0	49.6
Putnam	....	....	....	56.6*	22.3	....	....	....	39.4
Rodney	....	62.9*	72.2	69.6*	....	....	....	....	....
Sauk	66.0**	63.7*	100.1*	82.2**	20.0	66.4	66.5	67.4	51.1
Waubay	61.0*	73.7**	96.3*	76.8**	17.2	65.0	66.0	63.4	47.0
Average	58.6	67.3	82.7	67.0	22.8	61.1	61.2	58.9	45.2

For footnote a, see bottom of Table 1 on page 20.

Table 1. — YIELD OF DRILL PLOTS[a] — Concluded
Seven Locations, 1955-1957

Variety	Bushels per acre						
	SOUTH-CENTRAL ILLINOIS: Brownstown,[b] Fayette County						
	1953	1954	1955	1956	'53-'56	'54-'56	'55-'56
Andrew	59.5*	56.2*	102.7*	76.4*	73.7	78.4	89.6
Beedee	....	....	107.2*	82.6**	....	....	94.9
Bentland	....	....	99.7*	73.6*	....	....	86.7
Bonda	47.8	47.9*	....	....	....	....	....
Burnett	....	....	....	93.2**	....	....	....
Clarion	55.8*	....	106.8*	80.6**	....	....	93.7
Clintland	49.4	38.9	101.3*	67.9*	64.4	69.4	84.6
Clinton 11	42.9	46.5*	92.1	69.1*	62.7	69.2	80.6
Columbia	45.6	....	94.2	....	....	....	....
Fayette	....	....	....	77.0*	....	....	....
Logan	....	48.2*	93.2	78.2**	....	73.2	85.7
Minland	....	....	102.1*	....	....	....	....
Mo. O-205	57.4	51.9	105.9	72.1	71.8	76.6	89.0
Nemaha	51.8	49.4*	94.1	70.1*	66.4	71.2	82.1
Newton	57.4*	....	104.1*	70.9*	....	....	87.5
Putnam	....	....	....	75.1*	....	....	....
Waubay	51.2	....	....	84.5**	....	....	....
Average	49.7	46.0	98.9	76.5	67.7	73.0	87.4

[a] Each drill plot was approximately 1/50th acre, seeded with a drill, and harvested with a combine. Each variety was replicated 3 or 4 times at each location. Each yield is an average of the yield of 3 or 4 plots.

The check variety is shown in heavy black type. Annual yields with a double star were significantly higher than the yields of the check variety; annual yields with one star were not significantly different from those of the check; and annual yields with no star were significantly lower than those of the check. Differences necessary for significance were determined only for annual yields.

[b] Late plantings (May 7) at Brownstown were not worth harvesting for yield in 1957.

Table 2. — YIELD OF ROD-ROW PLOTS:[a] Seven Locations, 1955-1957

Variety	Bushels per acre				
NORTHERN ILLINOIS: Shabbona, DeKalb County					
	1955	1956	1957	1955-1957	1956-1957
Andrew	70.9	72.9	104.9*	82.9	88.9
Beedee	77.5*	91.6*	109.8*	93.0	100.7
Bentland	78.7*	77.1*	96.8	84.2	86.9
Bonda	64.5	....	....	....	....
Branch	85.3*	69.8	88.7	81.3	79.3
Burnett	76.8*	91.4*	104.1	90.8	97.8
Clarion	79.3*	73.1	90.0	80.8	81.6
Clintland	**83.9**	**87.2**	**114.2**	**95.1**	**100.7**
Clinton	81.2*	65.9	77.3	74.8	71.6
Columbia	49.2	....	....	....	....
Fayette	62.5	83.7*	85.8	77.3	84.7
Garry	84.2*	105.2**	101.0	96.8	103.1
Logan	73.0	71.8	100.7	81.8	86.3
Minhafer	76.9*	91.0*	111.0*	93.0	101.0
Minland	75.9*	80.3	104.1	86.8	92.2
Mo. O-205	74.4*	83.4*	94.9	84.2	89.2
Nemaha	65.9	71.6	89.1	75.5	80.4
Newton	78.2*	88.6*	107.9*	91.6	98.3
Putnam	51.2	74.7	84.9	70.3	79.8
Rodney	84.6*	78.6*	88.9	84.0	83.8
Sauk	86.7*	91.7*	106.1*	94.8	98.9
Simcoe	85.7*	76.2*	111.5*	91.1	93.9
Waubay	75.6*	85.3*	86.5	82.5	85.9
Average	74.9	81.5	98.0	85.4	89.7
NORTHEASTERN ILLINOIS: Elwood, Will County					
	1955	1956	1957	1955-1957	1956-1957
Andrew	73.3*	67.4*	51.9	64.2	59.7
Beedee	77.1*	76.3*	53.4	68.9	64.9
Bentland	84.1*	68.8*	52.3	68.4	60.6
Branch	71.9*	70.1*	31.5	57.8	50.8
Burnett	....	80.9*	54.7*	....	67.8
Clarion	80.5*	86.4*	36.8	67.9	61.6
Clintland	**81.7**	**76.4**	**60.8**	**73.0**	**68.6**
Clinton	74.7*	76.9*	27.1	59.6	52.0
Fayette	68.2*	75.2*	60.5*	68.0	67.9
Garry	71.7*	70.7*	30.6	57.7	50.7
Logan	65.7	79.7*	49.4	64.9	64.6
Minhafer	....	81.9*	59.6*	....	70.8
Minland	67.9*	73.3*	....	....	....
Mo. O-205	78.4*	79.0*	51.1	69.5	65.1
Nemaha	78.9*	66.8*	43.8	63.2	55.3
Newton	79.7*	76.1*	41.3	65.7	58.7
Putnam	....	64.8	19.5	....	42.2
Rodney	66.0	59.9	....	....	....
Sauk	74.2*	81.0*	47.4	67.5	64.2
Simcoe	77.9*	70.2*	46.2	64.8	58.2
Waubay	70.4*	80.2*	39.9	63.5	60.1
Average	74.6	74.4	45.1	65.3	60.2

For footnote a, see bottom of Table 2 on page 24.

Table 2. — YIELD OF ROD-ROW PLOTS[a] — Continued

Variety	Bushels per acre				
WEST NORTH-CENTRAL ILLINOIS: Oneida, Knox County					
	1955	1956	1957	1955-1957	1956-1957
Andrew	77.8*	85.5*	65.1	76.1	75.3
Beedee	66.6*	93.9**	87.0*	82.5	90.5
Bentland	59.3*	78.6*	66.8	68.2	72.7
Branch	61.3*	89.9**	80.4	77.2	85.2
Burnett	....	93.5**	87.1*	....	90.3
Clarion	79.5*	93.6**	80.9	84.7	87.3
Clintland	**71.5**	**83.0**	**88.6**	**81.0**	**85.8**
Clinton	64.5*	75.2	70.2	70.0	72.7
Fayette	64.8*	78.9*	68.3	70.7	73.6
Garry	66.2*	98.7**	84.5*	83.1	91.6
Logan	72.8*	83.2*	70.1	75.4	76.7
Minhafer	....	93.2**	90.2*	....	91.7
Minland	63.6*	84.5*	....	....	....
Mo. O-205	86.0**	86.9*	84.2*	85.7	85.6
Nemaha	67.6*	71.4	70.3	69.8	70.9
Newton	74.4*	87.2*	71.6	77.7	79.4
Putnam	....	58.9	56.5	....	57.7
Rodney	57.3	91.2**	....	....	....
Sauk	76.7*	101.4**	79.7	85.9	90.6
Simcoe	66.6*	93.1**	86.8*	82.2	90.0
Waubay	76.3*	91.9**	77.2	81.8	84.6
Average	69.6	86.4	77.1	78.3	81.7
WEST-CENTRAL ILLINOIS: Carthage, Hancock County					
	1955	1956	1957	1955-1957	1956-1957
Andrew	50.1*	36.7**	35.5	40.8	36.1
Beedee	61.3*	28.6*	33.2	41.0	30.9
Bentland	43.9*	26.4*	41.8	37.4	34.1
Branch	41.7*	27.5*	12.6	27.3	20.1
Burnett	....	32.6*	32.2	....	32.4
Clarion	48.2*	36.2*	16.3	33.6	26.3
Clintland	**49.9**	**29.1**	**51.5**	**43.5**	**40.3**
Clinton	45.3*	32.8*	11.7	29.9	22.3
Fayette	45.7*	27.7*	49.8*	41.1	38.7
Garry	41.4*	29.5*	21.4	30.8	25.5
Logan	46.3*	30.6*	18.8	31.9	24.7
Minhafer	....	36.0*	50.7*	....	43.4
Minland	42.7*	31.8*	....	....	....
Mo. O-205	49.5*	30.6*	22.7	34.3	26.7
Nemaha	38.9*	30.5*	38.6	36.0	34.6
Newton	55.3*	28.1*	27.9	37.1	28.0
Putnam	....	30.6*	22.3	....	26.5
Rodney	32.7	22.7*	....	....	....
Sauk	49.5*	35.1*	28.8	37.8	32.0
Simcoe	54.7*	33.7*	24.3	37.6	29.0
Waubay	47.2*	37.3**	21.3	35.3	29.3
Average	46.9	31.2	29.5	35.9	30.6

For footnote a, see bottom of Table 2 on page 24.

Table 2. — YIELD OF ROD-ROW PLOTS[a] — Continued

Variety	Bushels per acre				
CENTRAL ILLINOIS: Hartsburg, Logan County					
	1955	1956	1957	1955-1957	1956-1957
Andrew	55.1*	71.9*	40.4*	55.8	56.2
Beedee	68.4*	70.9*	47.6*	62.3	59.3
Bentland	52.1	58.8*	44.3*	51.7	51.6
Branch	74.8**	71.0*	30.7	58.8	50.9
Burnett	....	72.3*	42.5*	....	57.4
Clarion	77.4**	75.9*	34.1	62.5	55.0
Clintland	**60.5**	**62.9**	**42.7**	**55.4**	**52.8**
Clinton	63.9*	65.5*	30.5	53.3	48.0
Fayette	53.1*	57.9*	26.3	45.8	42.1
Garry	70.8**	63.8*	38.5*	57.7	51.2
Logan	60.4*	74.6*	42.8*	59.3	58.7
Minhafer	....	72.2*	42.0*	....	57.1
Minland	60.3*	68.2*	....	....	....
Mo. O-205	63.6*	74.3*	47.2*	61.7	60.8
Nemaha	58.3*	55.8*	38.1*	50.7	47.0
Newton	70.7**	64.2*	40.9*	58.6	52.6
Putnam	....	45.9	32.7	....	39.3
Rodney	68.9**	67.6*	....	....	....
Sauk	82.0**	60.8*	39.7*	60.8	50.3
Simcoe	73.3**	72.7*	27.8	57.9	50.3
Waubay	77.5**	70.3*	29.4	59.1	49.9
Average	66.2	66.5	37.8	57.0	52.1
EAST-CENTRAL ILLINOIS: Urbana, Champaign County					
	1955	1956	1957	1955-1957	1956-1957
Andrew	81.8*	106.1**	70.5	86.1	88.3
Beedee	81.8*	92.4*	72.2	82.1	82.3
Bentland	60.6*	87.8*	75.3	74.6	81.6
Bonda	69.1*	....	....	....	....
Branch	69.8*	99.6*	40.7	70.0	70.2
Burnett	78.3*	98.9*	76.8	84.7	87.9
Clarion	78.9*	109.5**	55.0	81.1	82.3
Clintland	**71.4**	**93.0**	**89.6**	**84.7**	**91.3**
Clinton	62.2*	92.2*	47.8	67.4	70.0
Columbia	60.2*	79.6	....	....	....
Fayette	83.1*	94.4*	79.0	85.5	86.7
Garry	82.9*	101.9*	58.1	81.0	80.0
Logan	79.6*	97.8*	74.5	84.0	86.2
Minhafer	87.8**	93.6*	100.4**	93.9	97.0
Minland	78.5*	91.1*	84.4*	84.7	87.8
Mo. O-205	84.9**	98.3*	72.6	85.3	85.5
Nemaha	70.4*	90.1*	70.8	77.1	80.5
Newton	79.7*	89.5*	73.5	80.9	81.5
Putnam	73.4*	81.5	68.9	74.6	75.2
Rodney	77.8*	93.1*	37.1	69.3	65.1
Sauk	84.9**	109.1**	73.2	89.1	91.2
Simcoe	84.9**	101.1*	67.9	84.6	84.5
Waubay	83.3*	107.3**	50.8	80.5	79.1
Average	76.8	95.8	68.5	81.0	82.6

For footnote a, see bottom of Table 2 on page 24.

Table 2. — YIELD OF ROD-ROW PLOTS[a] — Concluded

Variety	Bushels per acre		
SOUTH-CENTRAL ILLINOIS: Brownstown,[b] Fayette County			
	1955	1956	1955-1956
Andrew	88.6*	82.7*	85.7
Beedee	80.8*	75.7*	78.3
Bentland	52.5	59.8	56.2
Bonda	....	....	....
Branch	....	81.6*	....
Burnett	....	97.7	....
Clarion	87.0*	85.3*	86.2
Clintland	90.9*	71.3	81.1
Clinton	86.5*	66.3	76.4
Columbia	....	....	....
Fayette	85.4*	73.8	79.6
Garry	79.7*	86.9*	83.3
Logan	90.8*	78.1	84.5
Minhafer	....	74.8	....
Minland	64.9	65.2	65.1
Mo. O-205	86.8	89.1	88.0
Nemaha	83.1*	78.4	80.8
Newton	85.5*	76.3	80.9
Putnam	....	80.9*	....
Rodney	....	73.2	....
Sauk	....	84.1*	....
Simcoe	83.1*	82.2*	82.6
Waubay	78.7*	83.9*	81.3
Average	81.6	78.4	79.3

[a] Each plot consisted of two 8-foot rows, 1 foot apart. Each plot was replicated 3 or 4 times and harvested by hand. Each yield is an average of the yield of 3 or 4 plots.
The check variety is shown in heavy black type. Annual yields with a double star were significantly higher than the yields of the check variety; annual yields with one star were significantly different from those of the check; and annual yields with no star were significantly lower than those of the check. Differences necessary for significance were determined only for annual yields.

[b] Late plantings (May 7) at Brownstown were not worth harvesting for yield in 1957.

DEFINITION OF TECHNICAL TERMS

Fungus — a low form of plant life, lacking chlorophyll and being incapable of making its own food. It lives on dead or living plant or animal matter. The plural of fungus is fungi.

Glume — the chaffy leaflike structures enclosing each spikelet of oats.

Node — the joint of a stem.

Spikelet — a unit of the oat head. Each spikelet contains two kernels, commonly known as the "big oat" and the "little oat."

Spore — a reproductive unit of a fungus. A spore corresponds to a seed in plants.

Teliospores — resting type spores often formed in late summer or near the end of a growing season.

Tiller — any stem except the main stem of an oat plant. Tillering is commonly known as "stooling."

Urediospores — summer spores that spread rust from oats to oats.

15M—1-58—64602